Claims

What is claimed is:

[c1] A method for determining a molecular property of each constituent in a mixture of hydrocarbons comprising:

deriving at least one dynamic parameter for each constituent in the mixture from nuclear magnetic resonance data measured on the mixture; and

calculating the molecular property for the each constituent in the mixture from the at least one dynamic parameter for each constituent.

[c2] The method of claim 1, wherein the deriving the at least one dynamic parameter comprises generating a model that includes a plurality of components for the constituents of the mixture and iteratively modifying the model components to optimize the model with respect to the nuclear magnetic resonance data.

[c3] The method of claim 1, wherein the at least one dynamic parameter comprises one selected from a longitudinal relaxation time, a transverse relaxation time, a ratio of longitudinal to transverse relaxation time, and a diffusion rate.

[c4] The method of claim 1, wherein the mixture of hydrocarbons is disposed in a geological formation.

[c5] The method of claim 1, wherein the calculating the molecular property for the each constituent in the mixture from the at least one dynamic parameter comprises correlating the at least one dynamic parameter of the each constituent with an effective viscosity of the each constituent.

[c6] The method of claim 5, wherein the correlating comprises deriving empirical parameters from a suite of hydrocarbon samples.

[c7] The method of claim 6, wherein the suite of hydrocarbon samples comprises crude oils.

[c8] The method of claim 1, wherein the calculating the molecular property comprises using a neural network.

[c9] A method for determining a molecular property of each constituent in a mixture of hydrocarbons, comprising:

measuring nuclear magnetic resonance data of the mixture;

deriving at least one dynamic parameter for the each constituent in the mixture from the nuclear magnetic resonance data; and

calculating a molecular property for the each constituent in the mixture from the at least one dynamic parameter for the each constituent.

[c10] The method of claim 9, wherein the deriving the at least one dynamic parameter comprises generating a model that includes a plurality of components for the constituents of the mixture and iteratively modifying the model components to optimize the model with respect to the nuclear magnetic resonance data.

[c11] The method of claim 9, wherein the at least one dynamic parameter comprises one selected from a longitudinal relaxation time, a transverse relaxation time, a ratio of longitudinal to transverse relaxation time, and a diffusion rate.

[c12] The method of claim 9, wherein the mixture of hydrocarbons is disposed in a geological formation.

[c13] The method of claim 9, wherein the calculating the molecular property for the each constituent in the mixture from the at least one dynamic parameter comprises correlating the at least one dynamic parameter of the each constituent with an effective viscosity of the each constituent.

[c14] The method of claim 13, wherein the correlating comprises deriving empirical parameters from a suite of hydrocarbon samples.

[c15] The method of claim 14, wherein the suite of hydrocarbon samples comprises crude oils.

[c16] The method of claim 9, wherein the calculating the molecular property comprises using a neural network.

[c17] The method of claim 9, wherein the measuring nuclear magnetic resonance data comprises using one tool selected from a wireline nuclear magnetic resonance tool, a logging while-drilling nuclear magnetic resonance tool, and a modular formation dynamics tester or a laboratory nuclear magnetic resonance instrument

[c18] A method of well logging comprising:

moving a nuclear magnetic resonance tool along a wellbore;

making nuclear magnetic resonance measurements of a mixture of hydrocarbons;

deriving at least one dynamic parameter for each constituent in the mixture from the nuclear magnetic resonance measurements; and

calculating a molecular property for the each constituent in the mixture from the at least one dynamic parameter for each constituent.

[c19] The method of claim 18, wherein the deriving the at least one dynamic parameter comprises generating a model that includes a plurality of components for the constituents of the mixture and iteratively modifying the model components to optimize the model with respect to the nuclear magnetic resonance measurements.

[c20] The method of claim 18, wherein the at least one dynamic parameter comprises one selected from a longitudinal relaxation time, a transverse relaxation time, a ratio of longitudinal to transverse relaxation time, and a diffusion rate.

[c21] The method of claim 18, wherein the calculating the molecular property for the each constituent in the mixture from the at least one dynamic parameter comprises correlating the at least one dynamic parameter of the each constituent with an effective viscosity of the each constituent.

[c22] The method of claim 21, wherein the correlating comprises deriving empirical parameters from a suite of hydrocarbon samples.

[c23] The method of claim 22, wherein the suite of hydrocarbon samples comprises crude oils.

[c24] The method of claim 18, wherein the calculating the molecular property comprises using a neural network.

[c25] The method of claim 18, wherein the nuclear magnetic resonance tool comprises one selected from a wireline nuclear magnetic resonance tool, a logging while-drilling nuclear magnetic resonance tool, and a modular formation dynamics tester.

[c26] A method for determining molecular property distribution in a liquid sample, comprising:

determining a nuclear magnetic resonance parameter distribution of the liquid sample, wherein the nuclear magnetic resonance parameter comprises one selected from longitudinal relaxation time, transverse relaxation time, a ratio of longitudinal to transverse relaxation time, and a diffusion rate; and

calculating a molecular property distribution for the liquid sample from the nuclear magnetic resonance parameter distribution.

[c27] The method of claim 26, wherein the calculating comprises correlating the nuclear magnetic resonance parameter of each constituent in the liquid sample with an effective viscosity of the each constituent.

[c28] The method of claim 27, wherein the correlating comprises deriving empirical parameters from a suite of hydrocarbon samples.

[c29] The method of claim 28, wherein the suite of hydrocarbon samples comprises crude oils.

[c30] The method of claim 26, wherein the calculating comprises using a neural network.

[C31] The method of claim 26, wherein the liquid sample comprises hydrocarbons.